

1:1 Model Research – National and State Perspectives

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National Research Perspective

In explaining "the case for ubiquitous computing" the Abell Foundation (2008) notes 1:1 computing programs are ultimately intended to improve academic achievement by changing instructional methods to be more student-centered, to require higher-order thinking, and to teach 21st century skills such as "information-gathering, communication, and problem-solving" (p. 2). The potential changes 1:1 computing brings to pedagogy is significant, but not necessarily consistent across schools or initiatives. A special edition of the Journal of Technology, Learning and Assessment presented four empirical studies that provided evidence of increased teacher and student engagement and modest student achievement gains (Bebell & O'Dwyer, 2010). While there is evidence that 1:1 programs do not increase test scores in all situations, especially in the case of paper-and-pencil tests (Warschauer, 2006; Weston & Bain, 2010), several studies have provided evidence that the use of laptops in the classroom can lead to increases in students' math and writing skills (Bebell, 2005; Sclater, Sicoly, Abrami, & Wade, 2006; Warschauer, 2006) and overall achievement (Shapley, Sheehan, Maloney, & Carnikas-Walker, 2010; Suhr, Hernandez, Grimes, & Warshauer, 2010). Results of other programs have shown improvement in attendance (Lane, 2003) and engagement (Bebell & Kay, 2010; Great Maine Schools Project, 2004; Warschauer, 2006), and one study's results indicated a decrease in disciplinary problems (Bebell, 2005).

Some studies have shown that carefully implemented 1:1 laptop initiative programs can increase students' general learning outcomes (Warschauer, 2006; Weston & Bain, 2010). Factors other than the distribution of laptops alone contribute to successful implementation. Teacher support for the initiative, effective instructional use of the technology, technical support, robust technical infrastructure, and quality of implementation are all influential in the success of a 1:1 laptop program (Weston & Bain, 2010). Schools must have not only the capability to use laptops for instruction effectively but also clear strategies and supports in place for ensuring effective student laptop use (Warschauer, 2006), including adequate hardware and software resources and strong leadership to guide the program (Kleiger Ben-Hur & Bar-Yossef, 2010; Maninger & Holden 2009; Silvernail & Lane, 2004;). Teachers' beliefs mediate the way they use technology in the classroom, and if teachers do not support the initiative they are less likely to integrate the laptops into their lesson plans (Antonietti & Giorgetti, 2006; Churchill, 2006; Ertmer, Addison, Lane, Ross & Woods, 2000; Penuel, 2006). Thus, in addition to school and district support, successful 1:1 initiatives require teachers to have access to professional development or tools that can aid them in integrating laptops into lesson plans (Kleiger Ben-Hur & Bar-Yossef, 2010; Penuel, 2006; Silvernail & Lane, 2004; Weston & Bain, 2010). Professional development experiences can enhance teachers' technology knowledge and skill level and therefore can improve the use of laptops in the classroom as well as teacher attitudes toward the technology (Kanaya, Light & Culp, 2005; King, 2002; Maninger & Holden, 2009; Swan & Dixon, 2006; Swan, Kratcoski, Mazzer & Schenker, 2005).

Critical Components - Although hardware and software resources are a critical component of these education technology projects, the most successful projects are those that focus on educational goals *supported by* technology, rather than those that focus directly on the technology itself. These successful projects also address:

1. Effective leadership and community support;
2. High-quality professional development to update the education workforce;
3. Alignment of standards, curriculum, instruction, and assessment;
4. 21st century skills and content integrated into the curriculum;
5. Digital content and tools appropriate for students;
6. Support for local instructional technology facilitators and technical support staff;
7. Appropriate digital devices to meet staff and student needs;
8. Broadband connectivity and wireless access throughout the school;
9. Supporting technology infrastructure and resources;
10. Policies to support future-ready teaching and learning; and
11. Sustainable funding via public-private partnerships

State-Level Implementation and Evaluation

Since 2008, the Friday Institute for Educational Innovation in the College of Education at NC State University has conducted several evaluations of federal-, state-, and locally-funded school-level technology immersion projects in North Carolina K-12 settings. These evaluations have involved 63,368 students and 2,854 teachers in 164 North Carolina schools.

Findings about Student Learning (Corn, Huff, Halstead, & Patel, 2011)

- **Student standardized test scores showed growth over time.**
 - *EOG Scores.* Results indicated that after controlling for demographic variables, technology immersion schools experienced significantly more growth over time in their Reading and Math EOG scale scores, relative to comparison schools. These students were more likely than students in comparison schools to improve their status from not passing to passing; and this growth was even more pronounced for economically disadvantaged students. Technology immersion middle schools showed significantly more growth in Math and Reading than comparison middle schools, with EOG test pass rates increasing over 16 percentage points from 2007 to 2011.
 - *EOC Scores.* The longer schools implement a technology immersion project, the higher the percent of students who perform at or above grade level. Recent analysis of 2009-2010 EOC scores revealed that the percent of students considered proficient across subject areas increased as the length of implementation of laptop projects increased. Also, participating schools with a higher percentage of disadvantaged students showed a greater increase in the percent of students who passed. Some high schools showed significantly more growth in EOC scale scores, including Algebra I, than comparison schools.
- **Graduation rates slightly improved.** Graduation rates for most participating high schools increased. Also, graduation rates for minorities increased slightly over time. Although these results were positive and promising, none of the changes have yet been identified as being statistically significant.
- **Student engagement increased.** Survey results indicate that students, teachers, and administrators reported students were more engaged and on-task. Student surveys reveal that students agreed that the more teachers used technology in class, the more they are interested in and enjoy school. Evaluators observed high levels of sustained behavioral involvement, positive emotional tone, and exertion of effort and concentration.
- **Students developed 21st century learning skills (e.g. life and career skills; learning and innovation skills; information, media, and technology skills).** Teachers in participating schools indicated that their students used technology at least once a week to complete tasks related to 21st century learning skills. In addition, more than half of all students surveyed indicated agreement or strong agreement that the use of technology at their schools helps them develop key 21st century learning skills and better prepared them for entering the workforce.

Findings consistent with student-related results from digital learning initiatives in other states including Maine, Texas, Pennsylvania, Michigan, Florida, Virginia (Argueta, Huff, Tingen, & Corn, 2011).

- Students have shown an increase in engagement and motivation after the implementation of several of the 1:1 initiatives.
- Association between laptop use and increased student achievement in several academic areas.
- Facilitated the development of 21st century skills (e.g., digital literacy, creativity and innovation skills, critical thinking and problem solving skills, communication and collaboration, and self-directed learning) among students.

Findings about Teaching (Corn, 2010)

- ***Teachers increased use of technology for both planning and instruction.*** Many schools reported that collaboration across subjects, grade levels, and even schools had increased. Teachers reported using technology daily for creating instructional materials and managing student information, and that they have better organized lesson plans as a result. Teachers reported using technology most often during class for presenting content, providing directions, and accessing online textbook resources.
- ***Ready Internet access increased the frequency, reliability, and quality of communication across the school.*** Teachers and students reported that having technology has increased communication between teachers, staff, administrators, students and parents
- ***Teachers moved from assigning independent work to collaborative, project-based lessons.*** Students, teachers, and administrators all commented during focus groups that technology enabled different modes of student collaboration. Data indicated that as teachers became more comfortable with using the technology in class they moved from requiring independent work from students to more collaborative, project-based activities.
- ***Teachers shifted to technology-enhanced modes of assessment.*** Technology has helped teachers embed ongoing assessments into instruction to monitor student learning and adjust instruction effectively and efficiently.
- ***Decrease in teacher turnover.*** Teachers/administrators reported teachers were more inclined to remain at their school, or delay retirement, *due to enthusiasm over availability of technological tools.* In 27 of the 31 schools, teacher turnover rates decreased since the baseline year of the technology innovation project.

Findings consistent with teacher-related results from digital learning initiatives in other states including Maine, Texas, Pennsylvania, Michigan, Florida, Virginia (Argueta, Huff, Tingen, & Corn, 2011).

- Teachers used the laptops to develop instructional materials, access information related to instruction, and communicate with colleagues;
- Students used laptops to complete classroom assignments and conduct research.
- Shift from teacher-centered to student-centered instructional practices in the classroom, with teachers facilitating more and presenting less, and many students becoming more self-directed learners.

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